

AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listing of claims in the application:

1. (Cancelled)

2.-21 (Cancelled)

22. (Cancelled)

23. (Previously Presented) A method for generating a magnetic field signal useable for locating an underground object comprising:

generating a reference signal having a reference signal frequency substantially equal to the integer multiple of 300 Hz;

receiving an information signal;

encoding the information signal to produce an encoded information signal;

modulating the reference signal with the encoded information signal at a predetermined bit rate to produce the drive signal, the drive signal including the carrier component and at least one information sideband including sideband energy, the encoding and bit rate causing a substantial portion of the sideband energy to be contained between the carrier component frequency and a frequency spaced 50 Hz from the carrier component frequency; and

driving a transponder with the drive signal to generate the magnetic field signal, the magnetic field signal having a magnetic field carrier component equal to the carrier component frequency.

24. (Currently Amended) The method of claim 23, wherein ~~step (b)~~ driving a transponder comprises driving the transponder with the drive signal to generate the magnetic field signal, the magnetic field signal having a magnetic field signal carrier component equal to the carrier component frequency and at least one magnetic field signal information sideband including magnetic field signal sideband energy, a substantial portion of the magnetic field signal sideband energy contained between the carrier component frequency and the frequency spaced 50 Hz from the carrier component frequency.

25. (Currently Amended) The method of claim 24, wherein ~~step (a.4)~~ modulating the reference signal comprises amplitude modulating the reference signal with the encoded information signal at a bit rate between 80 bits per second (pbs) and 50 bps to produce the drive signal.

26. (Currently Amended) The method of claim 25, wherein ~~step (a.4)~~ modulating the reference signal comprises amplitude modulating the reference signal with the encoded information signal at a bit rate of 75 bits per second to produce the drive signal.

27. (Previously Presented) A method for generating a magnetic field signal useable for locating an underground object comprising:

generating a reference signal having a reference signal frequency substantially equal to the integer multiple of 300 Hz;

receiving an information signal;

encoding the information signal to produce an encoded information signal;

modulating the reference signal with the encoded information signal at a predetermined bit rate to produce the drive signal, the drive signal including the carrier component and a lower

information sideband and an upper information sideband, each of the lower and upper information sideband including respective sideband energy, the encoding and bit rate causing

(i.) a substantial portion of the lower sideband energy to be contained between the carrier component frequency and a frequency spaced 50 Hz below the carrier component frequency, and

(ii.) a substantial portion of the upper sideband energy to be contained between the carrier component frequency and a frequency spaced 50 Hz above the carrier component frequency; and

driving a transponder with the drive signal to generate the magnetic field signal, the magnetic field signal having a magnetic field carrier component equal to the carrier component frequency.

28. (Currently Amended) The method of claim 27, wherein ~~step (b)~~ driving a transponder comprises driving the transponder with the drive signal to generate the magnetic field signal, the magnetic field signal having

a magnetic field signal carrier component equal to the carrier component frequency,
a lower magnetic field signal information sideband, and
an upper magnetic field signal information sideband,

wherein the lower magnetic field signal information sideband includes magnetic field signal lower sideband energy, a substantial portion of the magnetic field signal lower sideband energy contained between the carrier component frequency and the frequency spaced 50 Hz below the carrier component frequency, and

wherein the upper magnetic field signal information sideband includes magnetic field signal upper sideband energy, a substantial portion of the magnetic field signal upper sideband energy contained between the carrier component frequency and the frequency spaced 50 Hz

above the carrier component frequency.

29. (Currently Amended) The method of claim 28, wherein ~~step (a.4)~~ modulating the reference signal comprises amplitude modulating the reference signal with the encoded information signal at a bit rate between 80 bits per second (pbs) and 50 bps to produce the drive signal.

30. (Currently Amended) The method of claim 29, wherein ~~step (a.4)~~ modulating the reference signal comprises amplitude modulating the reference signal with the encoded information signal at a bit rate of 75 bits per second to produce the drive signal.

31. (Cancelled)

32. (Previously Presented) A system for generating a magnetic filed signal usable for locating an underground object comprising:

- a subsystem to produce a drive signal including a carrier component frequency substantially equal to an integer multiple of 300Hz;

- a transponder to generate the magnetic field signal when driven by the drive signal, the carrier component equal to the carrier component frequency;

- wherein the subsystem comprises:

- a reference signal generator to produce a reference signal having a reference signal frequency substantially equal to the integer multiple of 300 Hz;

- at least one sensor to produce an information signal;

- an encoder to encode the information signal to produce an encoded information signal;

a modulator to modulate the reference signal with the encoded information signal at a predetermined bit rate to produce the drive signal, the drive signal including the carrier component and at least one information sideband including sideband energy, the encoder and bit rate causing a substantial portion of the sideband energy to be contained between the carrier component frequency and a frequency spaced 50 Hz from the carrier component frequency; and

a transponder to generate the magnetic filed signal when driven by the drive signal, the magnetic filed signal having a magnetic filed carrier component equal to the carrier component frequency.

33. (Original) The system of claim 32, wherein the magnetic field signal also has at least one magnetic field signal information sideband including magnetic field signal sideband energy, a substantial portion of the magnetic field signal sideband energy contained between the carrier component frequency and the frequency spaced 50 Hz from the carrier component frequency.

34. (Original) The system of claim 33, wherein the modulator amplitude modulates the reference signal with the encoded information signal at a bit rate between 80 bits per second (pbs) and 50 bps to produce the drive signal.

35. (Original) The system of claim 33, wherein the modulator amplitude modulates the reference signal with the encoded information signal at a bit rate of 75 bits per second to produce the drive signal.

36. (Original) The system of claim 32, wherein the at least one information sideband produced by the modulator comprises a lower information sideband and an upper information

sideband, each of the lower and upper information sideband including respective sideband energy, the encoder and bit rate causing

(i.) a substantial portion of the lower sideband energy to be contained between the carrier component frequency and a frequency spaced 50 Hz below the carrier component frequency, and

(ii.) a substantial portion of the upper sideband energy to be contained between the carrier component frequency and a frequency spaced 50 Hz above the carrier component frequency.

37. (Original) The system of claim 36, wherein the magnetic field signal generated by the transponder, when driven by the drive signal, includes

a magnetic field signal carrier component equal to the carrier component frequency,

a lower magnetic field signal information sideband, and

an upper magnetic field signal information sideband,

the lower magnetic field signal information sideband including magnetic field signal lower sideband energy, a substantial portion of the magnetic field signal lower sideband energy contained between the carrier component frequency and the frequency spaced 50 Hz below the carrier component frequency, and

the upper magnetic field signal information sideband including magnetic field signal upper sideband energy, a substantial portion of the magnetic field signal upper sideband energy contained between the carrier component frequency and the frequency spaced 50 Hz above the carrier component frequency.

38. (Original) The system of claim 36, wherein the modulator amplitude modulates the reference signal with the encoded information signal at a bit rate between 80 bits per second (pbs) and 50 bps to produce the drive signal.

39. (Original) The system of claim 36, wherein the modulator amplitude modulates the reference signal with the encoded information signal at a bit rate of 75 bits per second to produce the drive signal.